

DUAL SOLUTION APPLICATION SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to a dual solution applicator, and in particular to an applicator for cleaning textiles which brings two or more reactive solutions together momentarily before contacting the textile to be cleaned.

The use of cleaning agents to remove soil, oils and other stains from carpet, upholstery and other textiles is well known. Typically, a composition is mixed from one or more solutions and then applied to the textile by an applicator. Often the compositions include soaps and other detergents which are generically referred to as "surfactants." By "surfactant" is meant a synthetic amphipathic molecule having a large non-polar hydrocarbon end and a polar end which is water soluble. Numerous different types of applicators have been developed for applying various types of surfactant solutions, and for applying the solutions to various types of textiles. However, the vast majority of these applicators apply a single composition. Until relatively recently, the surfactants have been the cleaning agent of choice, despite the fact that surfactants leave an oily residue on the textile that makes the textile more prone to resoiling, and are generally unfriendly to the environment.

Recently, several advances have occurred in the cleaning arts which enable cleaning compositions to reduce, or in some cases all together eliminate, the use of surfactants. For example, in U.S. Pat. No. 4,219,333, a significant improvement in the art of cleaning textile fibers is shown. This patent shows that, when detergent solutions are carbonated and applied to the fibers, the solution quickly penetrates the fibers and lifts away soil and oil by effervescent action. Because of the improved cleaning ability of the carbonated solution, significantly less surfactants need be used to clean the textiles. While such a method required a pressurized container to carbonate the cleaning solution, a traditional applicator applying a single solution could be used.

In U.S. patent application No. 5,244,468, a urea containing internally carbonated non-detergent cleaning composition and method of use are disclosed. The invention improved on that disclosed in U.S. Pat. No. 4,219,333, by providing a composition which avoids the need for a pressurized carbon dioxide tank to carbonate the cleaning composition. Instead, the components of the composition react with one another to internally carbonate the solution. The composition is stored in a pressurized container after mixing to maintain carbonation in the composition. Because a single container holds the cleaning composition, and because the solution is used well after the actual reaction occurred, a single solution applicator could be used.

Recently, however, it has been discovered that the benefits of a carbon dioxide effervescence can be increased by having a two or more solutions undergo a chemically or internally-carbonating reaction while actually on the textile to be cleaned. Furthermore, it has been found that the cleaning ability of an effervescent chemically induced carbonating solution is greatly increased when the solution is heated to between 140° F. and 200° F. While effective, both of these methods of increasing the cleaning ability of the composition have physical restraints which significantly limit the ability to use the improvements with conventional applicators. In order to develop an internally-carbonating composition in which the reaction actually occurs on the textile, the solutions which react to release the carbon dioxide must be mixed either on the textile, or very shortly

before application to the textile (typically almost instantaneously but not more than about 10-15 seconds). If a conventional applicator is used, the carbon dioxide producing reaction will occur in the container holding the solution, and very little carbonation will reach the textile unless the container is pressurized.

Additionally, a carbonated solution cannot be heated because heating the composition dramatically decreases the ability of the solution to retain carbon dioxide. In the past, the benefits of high temperature cleaning have been overlooked as a combined method with a carbonated cleaning composition because the benefits of heating were offset by the decreased solubility of the carbon dioxide in the solution.

Recently it was discovered that by mixing a carbonate salt solution and an acid solution on the textile or infinitesimally before application allowed the carbonating reaction to occur on the textile. Additionally, the decreased solubility of the carbon dioxide in a heated composition is overcome by having a reaction of solutions occur coincident with application of the carbonating solution to the textile, as carbon dioxide solubility is of little importance in an internally-carbonating composition instantly applied. However, to have an internally-carbonating, heated composition, the carbonate solution and the acid solution must be heated separately, and kept separate until immediately before application to the textile.

While this method of heating the two solutions and then combining them works extremely well, the conventional applicators or systems have no method for heating and maintaining the acid and carbonate solutions separately and then bringing them together coincident with their application to textile fibers. Thus, there is a need for a dual solution applicator system which holds solutions separately, and then mixes the solutions shortly before application to the textile so as to generate the desired carbonating reaction.

While discussed above as a means for holding and heating a carbonate solution and an acid solution, a dual solution applicator could also be used for any other application system requiring the separating of two components until just prior to their use, i.e. in instances where there will occur an exothermic reaction, or for combining immiscible liquids such as a hydrocarbon solvent and an aqueous solution until the appropriate time. By holding certain cleaning solutions separate until application or immediately before application, significant improvements in cleaning may be made while minimizing or optimizing the use of surfactants and other undesirable chemicals.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a dual solution applicator which houses solutions in separate containers and provides means for their admixing and application.

It is another object of the present invention to provide a dual solution applicator which enables the separate solutions to be heated, admixed and dispensed in a controlled manner.

It is an additional object of the present invention to provide a dual solution applicator which can maintain the heat of the solutions within a desired range.

Yet another object of this invention is to provide an application system wherein a hot carbonating solution can be applied to a textile fabric as a sheet or spray of liquid without the solution coming into contact with non-textile objects such as hard surfaces (e.g., furniture or wood or tile flooring).